

## **REMARKS**

The Applicants respectfully request reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

### **I. Status of the Claims**

By way of this Amendment and Reply, Claims 3, 7, 8, 14, 16, 18, and 21 have been amended to correct minor informalities, Claims 24-42 have been canceled without prejudice or disclaimer, and new Claims 43-45 have been added. Support for these new claims can be found, for example, in paragraph [0028] of the published application (Pub. No. 2006/0272701) and in the original Claims 1 and 5 as filed. No new matter has been added. Upon entry of the above amendments, Claims 1-23 and 43-45 will be pending, with non-elected Claims 6, 8, 13, and 20 being withdrawn from consideration.

### **II. Objection to Claim 21**

In Section 6 of the Office Action, Claim 21 was objected to because of a typographical error. Claim 21 has been amended to correct the typographical error following the Office's suggestion. Accordingly, the Applicants respectfully request the withdrawal of the objection.

### **III. Claim Rejection Under 35 U.S.C. § 102**

In Section 8 of the Office Action, Claims 1-5, 7, 9-10, 17, 21, and 22 were rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by WO 98/39250 to Smalley (hereinafter "Smalley"), and the Office has used an article by Garg et al., "Effect of chemical functionalization on the mechanical properties of carbon nanotubes," Chem. Phys. Lett., October 16, 1998, 295, 237-278 (hereinafter "Garg") to provide supporting evidence. For at least the following reasons, the Applicants respectfully traverse this rejection.

Independent Claim 1 recites, among other elements, "photovoltaic organic molecules attached to defect sites on the carbon nanotubes." Smalley does not at all disclose at least this feature. On page 4 of the Office Action, the Office asserted that Smalley teaches that "the ends of the nanotubes are chemically functionalized/derivatized and therefore forms defect sites at the ends" and that "the dyes are bonded to the ends, i.e., defect sites." Thus, the Office has equated

the “ends” of carbon nanotubes to the “defect sites” of the carbon nanotubes. The Applicants respectfully disagree.

Neither Smalley nor Garg teaches, nor is it known in the art, that the “ends” of carbon nanotubes are the same as the “defect sites” of the carbon nanotubes. Smalley teaches that the carbon nanotubes “can be chemically derivatized at their ends (which may be made either open or closed with a hemi-fullerene dome).” *See, e.g.*, page 30, lines 18-20. Smalley further teaches that the “defects can be exploited chemically (e.g., oxidatively attacked) to cut” the single-wall nanotubes into smaller pieces. The resulting carbon nanotube bodies are “substantially defect-free.” *See, e.g.*, page 31, line 10. Smalley also teaches that “a photoactive dye” can be “attached to the end of each nanotube.” *See e.g.*, page 50, line 23. However, throughout its disclosure, Smalley is silent with respect to the “end of each nanotube” being the same as the “defect sites.” In fact, Smalley uses single-wall carbon nanotubes precisely because they are substantially defect free. *See e.g.*, page 8, lines 20-27.

The Office further asserted that Garg teaches that “functionalization” forms defects on the walls of carbon nanotubes and appeared to have equated the “functionalization” as taught by Garg to the “derivatization” as taught by Smalley. The Applicants respectfully submit that these are two very different concepts and that Smalley does not at all teach that derivatization forms defects. Further, those of ordinary skill in the art would not consider the “ends” of carbon nanotubes as “defect sites.”

In view of the above, Smalley, alone or as supported by Garg, does not disclose each and every element recited in present independent Claim 1. Thus, the teachings of Smalley (and Garg) cannot anticipate independent Claim 1 and its corresponding dependent claims. Accordingly, the Applicants respectfully request that the rejection be withdrawn.

#### IV. Claim Rejections Under 35 U.S.C. § 103

In Section 11 of the Office Action, Claims 11 and 12 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Smalley as applied to Claim 1, and further in view of Gopidas et al., “Photophysics and photochemistry of phenosafranin dye in aqueous and acetonitrile solutions,” Photochem. Photobiol., A: Chem., 1989, 48, 291-301 (hereinafter “Gopidas”). In Section 12 of the Office Action, Claims 14-16 and 18 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Smalley as applied to Claims 1 and 5, and further in view of U.S. Patent No. 6,084,176 to Shiratsuchi et al. (hereinafter “Shiratsuchi”). In Section 13 of the Office Action, Claim 20 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Smalley as applied to Claim 1, and further in view of U.S. Patent No. 6,353,777 to Bulovic et al. (hereinafter “Bulovic”). In Section 14 of the Office Action, Claim 23 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Smalley as applied to Claim 1, and further in view of U.S. Patent No. 4,611,914 to Homma (hereinafter “Homma”). For at least the following reasons, the Applicants respectfully traverse these rejections.

As discussed above, Smalley does not at all teach or suggest at least the “photovoltaic organic molecules attached to defect sites on the carbon nanotubes” as recited in present Claim 1. The teachings of the secondary references Gopidas, Shiratsuchi, Bulovic, and Homma, alone or in combination, do not remedy the deficiency of Smalley’s teachings. Furthermore, the Applicants respectfully submit that one of ordinary skill in the art would not have had a reason to combine the teachings of Smalley with the teachings of these secondary references, or to modify the systems disclosed therein to arrive at the presently claimed embodiments. In fact, Smalley teaches “substantially defect-free” carbon nanotubes, and thus teaches away from the presently claimed embodiments where the defect sites are utilized to have photovoltaic organic molecules attached thereon. Moreover, the “photoactive dye” of Smalley is designed to be attached to “the end of each nanotube,” and not the “defect sites” as recited in the present claims.

Further, if the device of Smalley were modified to have defects on the carbon nanotubes and photovoltaic organic molecules attached to the defect sites, the modification would render the carbon nanotubes of Smalley unsatisfactory for their intended purpose. This is because the defects can no longer be exploited to cut the nanotubes into smaller pieces, resulting in

substantially defect-free nanotubes as desired by Smalley. Thus, no *prima facie* obviousness can be established. See MPEP § 2143.01 (V) (stating that if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification.)

In sum, the teachings of Smalley, Gopidas, Shiratsuchi, Bulovic, and Homma cannot be properly combined. Even assuming, *arguendo*, that they were combined, the combined teachings would not teach or suggest all of the elements recited in present independent Claim 1. Thus, Claim 1 and its corresponding dependent claims are patentable over the teachings of these references.

Accordingly, the Applicants respectfully request that the rejections be withdrawn.

#### **V. Double Patenting**

In Section 16 of the Office Action, Claims 1-5, 7, 9-12, 14-10 and 21-23 were provisionally rejected on the ground of nonstatutory obviousness-type double patenting as allegedly being unpatentable over Claims 1-38 of copending Application No. 10/537,942.

The Applicants respectfully request that this provisional rejection be held in abeyance until the double patenting rejection becomes the only remaining rejection, at which time the Applicants request that the Office contact the undersigned to discuss options to overcome the rejection.

#### **VI. Rejoinder**

As discussed above, the Applicants believe that Claim 1 is allowable. Withdrawn Claims 6, 8, 13, and 20 depend from Claim 1, and thus should also be allowable for at least the reasons discussed above with respect to Claim 1. Accordingly, the Applicants respectfully request rejoinder and allowance of Claims 6, 8, 13, and 20.

#### **VII. New Claims**

Newly added Claim 43 depends from Claim 1, and thus should be allowable for at least the reasons discussed above with respect to Claim 1. In addition, Claim 43 recites that “the defect sites are located along the carbon nanotube bodies.” The Applicants respectfully submit

that the references cited in the Office Action do not teach or suggest at least this feature. Thus, Claim 43 is separately patentable over the cited references at least for this additional reason.

Newly added independent Claim 44 recites elements similar to those recited in Claim 43, and thus should be allowable for at least the reasons set forth above with respect to Claim 43. Claim 45 depends from Claim 44 and thus should be allowable for at least similar reasons.

Accordingly, the Applicants respectfully request entry and allowance of new Claims 43-45.

### **CONCLUSION**

The Applicants believe that the present application is now in condition for allowance, and thus respectfully request favorable reconsideration of the application.



The Office is invited to contact the undersigned by telephone if a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, the Applicants hereby petition for such extension under 37 C.F.R. § 1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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